HYDROCARBON GEOLOGY OF THE EXPLORATION AREA SZEGHALOM (BÉKÉS, HUNGARY).

by

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The Szeghalom petroleum occurence found in Békés country in the eastern part of the country is one of the important fields in the Hungarian petroleum industry. The perspectivity of the drilling exploration was justified by the previous seismic measurements. On the basis of these data the area showed a significant increase in pre-Tertiary hydrocarbon formation in Hungary. 53 percent of the fields initial geological hydrocarbon wealth is found in metamorphic rock formations.

Surface geophysical measurement which was started in 1977 proved the presence of geological structure and gave precisely clear picture of the geology and structure of the area. As a result of the surface geophysical measurements and their geological interpretation, the wells located between Szeghalom and Füzesgyarmat communities, a significant oil and natural gas pool was found.

The data of the 48 exploratory wells was able to give a clear picture of the geological setting of the area. The Precambrian basement which is strongly deformed consist of brecciated metamorphic rocks (amphibolites, amphibole – gneisses and small amount of granites).

The Miocene strata is of trangressive character. It's strata begins chiefly with coarse – grained conglomerate, and sandstones which is overlained by calcareous pelites. (limestone, calcareous – marl, marl). The Pannonian strata begins usually with calcareous marls. The upper part of the Lower Pannonian complex is characterized by prograded bedding, sandstone, clay, marl, aleurlite, the Upper Pannonian consists of alternating succession of sandstone and clay beds. Dominantly the young sedimentary rock ends up with terrestrial deposits.

The oil and natural gas in Szeghalom fields is found between 1842 – 2095 meters. The pool consists of two oil fields with rich gascap. The thickness of the gascap in Halom – 1 field does not exceed 100 meters. That of the oil fields varies from 5 – 27 m. The oil-water boundary is tilted, it varies from 1980 – 2015 m below sea level. The gas-oil boundary is relatively uniform, it is about – 1975 m in field – 1 and – 1995 m field – 2. More than 100 drill stem test show that, from the relatively thin oil body it is difficult to gain a water free inflow.

The two fields have a common water body which is actively recharged. The trap is a statigraphic one, its caprock is Lower Pannonian calcareous marl.

70 percent of hydrocarbon bearing rockmass in Halom – 1 reservoir consist of brecciated, fissured metamorphic rock. In the development of the reservoir, an important role was played by the multi-phase regional metamorphism. The formation porosity and water saturation can be reliably determined from well logs. However, direct measurements from the core samples would give much lower porosity values and worse inflow. The same can be established in connection with permeability. Correct permeability values can be estimated from flow rate measurements. The Miocene clastic rocks forms the entire reservoir of the Halom – 2 field. On the grounds of more than 200 values measured on the core samples, the porosity and permeability relationship of the reservoir was well known.

Adequate pressure and temperature data was at our disposal to determine satisfactory physical parameters of the reservoir. The same applies to the determination of natural gas, distillate, petroleum and water characteristics in the reservoir.

I completed the reserves calculation on the basis of the isovol maps drawn from calculated porosity values, well logs, water saturation and effective thickness values.

The initial producable petroleum reserves in the metamorphic reservoir – because of the little knowledge aquired about the reservoir's characteristics – is small, 15 percent. For the Miocene reservoir I calculated 30 percent production.

I took the initial gas reserves production from the field's known analogy as 80 percent.

On the basis of the already known geological and organic geochemical data, it was established that the prospecting area's environments have hydrocarbon formation conditions. The surrounding depressions of the Miocene and the Lower Pannonian age pelitic strata were considered to be oil and gas hydrocarbon potential source rocks. The results of the genetic investigation shows that, the Szeghalom oil- and gas- hydrocarbon were originated from the catagenetic advance degree stage of the Békés deep depressions of the Miocene age source rocks.

The lateral migration of the hydrocarbon generated was made possible by the psammitic development of Pa_1^{1b} lithogenetic unit.

Along the pitch out of Pa_1^{1b} unit, the migration was ensured by the unconformity between the Miocene and the Precambrian basement and/or the coarse – grained Miocene strata.

The hydrocarbon accumulation were found in structure heights of Miocene and Old-Paleozoic reservoir rocks, under several hundred meter thick pelitic seal (Pa_1^2 -lithogenetic unit).

Futher hydrocarbon occurrence can be predicted, taking the facies analysis of the area into consideration. The recent outlook of the detailed surface geophysics work offer a proof. Considering the area's up to date hydrocarbon and geological results a further significant quantity – mainly natural gas – may be discovered.